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MULTI-PORT PHASE LOCKING UNDER NOISY CALIBRATING OSCILLATOR

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In radio electronics synchronization of generators with the help of phase locking is widely used. In an ideal case, a signal from an standard generator without distortions and noises reaches a phase detector as a harmonious signal with the frequency ω_{st}. If ω_0 is the angular frequency of the generator tuned, then $\Omega_{in} = \omega_{st} - \omega_0$ is the initial disorder of the generators frequency. Let $K(P)$ -transfer function of filter in operator form, φ- instant phase difference of generators, $F(\varphi)$ - standardized characteristics of a phase detector, Ω_r - maximum possible disorder(retention band). Then phase locking system equation in operator form is: $P\varphi + \Omega_r K(P) + F(\varphi)K(P)\Omega_{in}$.

This equation is called main phase locking system equation in an operator form.If the passage band of filter is sufficiently wide, then $K(P) = 1$. In this case dynamics of phase locking system can be analyzed using the first order differential equation with the delay:

$$\frac{d\varphi}{dt} + a(F(\varphi(t-\tau) + \xi(t) - \gamma) = 0$$

where $xi(t)$ is noise process. The result is obtained that in an ideal phase locking system with small stationary phase perturbations of standard generator on the border of stability domain, with the time the condition sets in which is close to oscillations with the frequency φ_0.